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ABSTRACT

An investigation of the continuing development of infants involved in a program of enriched group care is presented. The 30 advantaged infants had working mothers, and the 9 disadvantaged infants had nonworking mothers. In the original study, they were enrolled in private day care and involved in a program of total environmental care and parent guidance. Special methods of cognitive rule stimulation through play and warm and flexible personalized care were designed for each of four types of activities: developmental care routines, free play, guided learning, and excursions. Original results indicated a mean 20-point gain in IQ. A followup study carried out one and two years after the original investigation showed that all tested groups tended to rise considerably in IQ over the total period, despite temporary dips by three groups. The major evidence on socioemotional development also shows a generally continuing high and slightly increasing mean level of functioning on nearly all ratings. Exact measurement results are presented in four graphs. Concluding discussion focused on the lack of regression to or toward preprogram levels of functioning, although regression had been found to be characteristic for disadvantaged children in other studies. Possible reasons for greater developmental gains for advantaged infants are presented. (SDH)

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# A Follow-up Investigation of the Later Development of Infants in Enriched Group Care

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Does early experience produce effects on later development which can be distinguished from the effects of intervening developmental experiences? More specifically, will positive developmental gains in a cognitively stimulating and interpersonally sensitive infant day care program be evident one to four years after leaving the infant program? Are there differential effects for advantage-disadvantage, cohorts, sex, age of entry, length of stay, initial IQ or infant program IQ gains?

Background

There is a mounting body of evidence that early education programs generally result in shortterm developmental improvements and longterm regressions, (Karnes, 1972). Most of the evidence centers on the cognitive development of preschool 3-5 year old disadvantaged children. The few studies of infants in group care as yet report no follow-up investigation (e.g., Caldwell, 1973; Heber, 1973; and Robinson, 1968), except for the monumental 21 year follow-up study by Skeels (1966) of infants reared in an institution by retarded women according to a single caregiver model and the studies of Kibbutzim reared infants in which care combines family and agency day care arrangements (e.g., Maccoby and Feldman, 1972; Smilansky and Smilansky, 1968).

The present study is concerned with a shortterm follow-up of the cognitive and socioemotional development of both advantaged and disadvantaged Canadian urban infants reared in group day care for working mothers according to a multiple caregiver model. Theoretically, early experience is considered to be an essential basis for development which however is a continuing, cumulative function of the later forms of cognitive and socioemotional interaction built on the initial foundation. In the original study (Fowler, 1972), cumulative samples of 30 advantaged and 9 disadvantaged, 2 to 30 month old infants were

enrolled in a private day care center, following a program of a total environmental care and parent guidance. Advantaged mothers were working and disadvantaged were non-working. Special methods of cognitive rule stimulation (language stimulation, concept learning and problem solving processes) through play and warm and flexible personalized care were designed for each of four types of activity (developmental care routines, free play, guided learning and excursions). The center was extensively equipped with toys and learning materials. A teacher training program frequently permitted child care ratios of 1: 1 or better. Parent guidance centered on child rearing techniques, demonstrations of play stimulation techniques and problem counseling in family relations and management. Development of day care infants and a sample of home reared infants (N=18) matched in pairs with first year cohorts for age, sex, age placement mental scores, personality ratings and parent education was assessed through standardized mental tests (Bayley Scales; Binet after age two) and a variety of rating scales of socioemotional and motivational development(Bayley IBR (1969) and Schaefer and Aaronson (1967a); maternal characteristics and home environment were measured through ratings(Schaefer and Aaronson (1967b) and interviews. Children with possible organic deficit or gross emotional disturbance were excluded from the study.

The results showed various samples made mean IQ gains of 14 to 28 points between entry (Time 1) and graduation (Time 2), rising from about 100-110 to 116-130 for the total disadvantaged and advantaged groups, respectively, compared to only 7 points for Year I cohort, matched pair controls. All gains were significant except for the small disadvantaged sample and the home reared group. Among the subgroups of advantaged children, girls gained more than twice as much as boys (28 to 12 IQ points) to reach a similar high level

and both younger entering infants ($\bar{X}$ = 9 months) and longer staying infants ($\bar{X}$ = 13 months) gained means of about 22 IQ points compared to 10 points for older entering ($\bar{X}$ = 19 months) and shorter staying ($\bar{X}$ = 5 months) infants. Both advantaged and disadvantaged children were rated in play and during mental testing as typically average to superior on a rising trend in socioemotional and motivational characteristics, such as general emotional tone, autonomy, freedom from tension, inquisitiveness and perseverance, with advantaged children tending to rise more than disadvantaged children and advantaged girls more than advantaged boys. Gains in language competencies were especially high but motor skills changed relatively little. The influence of parent guidance appeared in several high and significant correlations between both gains in infant IQ scores and final (Time 2) IQ scores and several final ratings on maternal characteristics with both cognitive and emotional dimensions of child rearing, not correlated at the time of entry (Time 1).

Methods

The follow-up study was a two phase testing and parent interview program, carried out one and two years after termination of the original investigation. Children were assessed in their home through standardized mental scales (Griffiths Scales the first year and Binet the second) and ratings during testing on socioemotional and motivational functioning (Bayley Infant Behavior Record). Parents and home environmental changes were assessed through home interviews both years and the WAIS the first year.

The samples consisted of all locatable children from the original infant study, divided into groups as follows: 6 of the 9 original disadvantaged

and 28 of 30 advantaged day care children, consisting of 16 of the original 18 Year I cohort, for whom there were 11 matched pair, home reared controls, and 12 of the original 14 Years II and III day care cohorts. The respective ages for the disadvantaged, total advantaged and matched pair groups were 40, 47 and 58 months for the first follow-up (Time 3) and approximately a year older at the second follow-up (Time 4). The same children were located for both follow-up studies, except that two children tested late for the first follow-up are counted in both follow-up studies. Few assessments were made without tester knowledge of subject category because of limited resources.

## Results and Discussion

### Cognitive Development

The mean IQ changes for the five main follow-up samples over four testings are shown in Figure 1. It will be seen first that all groups tended

Figure 1

to rise considerably over the total period, but three groups showed a large temporary dip for the first follow-up testing (Time 3). This dip may reflect the generally lower IQ scores found on the Griffiths Scales used at Time 3 due perhaps to its English standardization (Fowler et al, 1973), but there is no ready explanation for the failure of two samples to decline. During a period averaging about a year[1] in the infant program, between Time 1 and Time 2, all day care groups gained markedly about 20 IQ points and these mean gains were maintained or increased slightly at the final follow-up period (Time 4)--except for a non-significant fall back of 6 points by the disadvantaged group. The home reared controls in contrast, gained significantly less (7 IQ points) than any of the other advantaged groups.

I shall not discuss in detail the test findings of the first follow-up period (Time 3), in view of their lack of comparability, except to note that mean scores on the Griffiths language subscale for all advantaged day care groups at Time 3 maintained a level ($\bar{X}$ = 124 to 141) about equal to or exceeding their high level Binet IQ scores at the end of the infant program--with one exception. The mean language IQ of the reduced sample (N=11) of the Year

[1]The Year II-III cohort sample (N=12) remained a mean of 8 months in the program.

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I cohort was only 118.7 compared to the high level mean of 127 scored by the matched pair home reared group. The disadvantaged also maintained a similar slight decline in level on this language subscale ($\bar{X}$ = 114). Otherwise, the mean Griffiths subscale scores for fine and gross motor, social performance and practical intelligence subscales were all recorded at generally lower levels like the mean GQ levels. At the final follow-up (Time 4), at mean ages of 4 to nearly 6 years, all advantaged groups ranged around a 130 point IQ level, although the small disadvantaged sample had partly regressed to a still high level of 114 IQ. Thus, among the advantaged children, while the day care had essentially maintained or slightly increased their mean IQ levels at the final follow-up, the home reared had gained a mean of 16.4 IQ points between the end of the infant period (Time 2) and the final follow-up period (Time 4). In this way there were no significant differences by analysis of covariance between the gain scores of any of the advantaged groups from the point of entry to the infant program (Time 1) to the final follow-up testing (Time 4).

Figure 2

Analysis of sex differences (Figure 2) of advantaged day care children revealed a continuing convergence of boys (N=16) and girls (N=12) at the final follow-up period (Time 4) that was noted at the time of graduation from the infant program (Time 2). Thus at mean ages of 54 and 58 months, the mean IQ of girls and boys were 137.1 and 133.1, a few points higher than the end of program means (Time 2) (134.6 and 126.5) and reversing the original 14 point difference in favour of boys (116.4 versus 102.8).

Figure 3

There is, on the other hand, a further spread at the final follow-up period (Time 4) of mean IQ differences between sub-groups differing on the jointly operating variables of earliness of entry and length of time in program. (Neither earliness of entry nor time in program, analyzed separately correlated significantly with change scores, because of their overlapping character.) By the second follow-up (Time 4) the mean IQ difference in favour of those entering earlier (9.2 versus 18.4 months) and staying longer (15.3 versus 5 months) increased to about 10 points (140.5 versus 130.7) as against 7 points (at Time 2) at the end of the infant program (133.2 and 126.7) and virtually no difference (at Time 1) on entry to the infant program (111.7 versus 111.0). (See Figure 3.) Thus while both groups gained significantly during the infant program period (Time 1 to Time 2), and increased their mean gains from graduation (Time 2) to the second follow-up (Time 4) earlier entering/longer staying children gained 10 points more than their counterparts (28.8 versus 19.7 points). The difference is not quite significant ($p = .15$) by analysis of covariance.

Figure 4

Another interesting analysis is in terms of subsamples of advantaged children whose mean IQ gains were either less than or reached 20 or more points (Figure 4) during the course of the infant program period (Time 1 to Time 2). Despite the mean high level of about 140 IQ reached by the higher gainers at the end of the infant

program (Time 2), compared to only 123 IQ by the low gainers, the former essentially maintained this high mean level (138.1), although the low infant program gainers gained a mean of 22.5 IQ points to 133.6, only 4.5 points less than the originally high gainers. Thus the initial infant program gains and final follow-up gains were both significantly negatively correlated (about -.75) with initial IQ level, controlling for age of entry and length of time in program, as might be expected. It is the maintenance of the high level gains through the second follow-up, however, which is of special interest.

## Socioemotional Development

The major evidence on follow-up status of socioemotional development, observations with the Bayley Infant Behavior Record during mental testing, shows a generally continuing high and slightly increasing mean level of functioning on nearly all ratings. Thus, while 23 of the mean ratings for all were rated at or slightly below scale midpoints for six items at the time of entry to day care (Time 1), only 9 mean ratings for five items equalled or fell below scale midpoints at graduation from the infant program (Time 2)--all except one of which were for home reared controls and the disadvantaged, and all mean ratings for all groups were above the mean at the final follow-up testing (Time 4). There was little consistent difference among the groups.

## Discussion

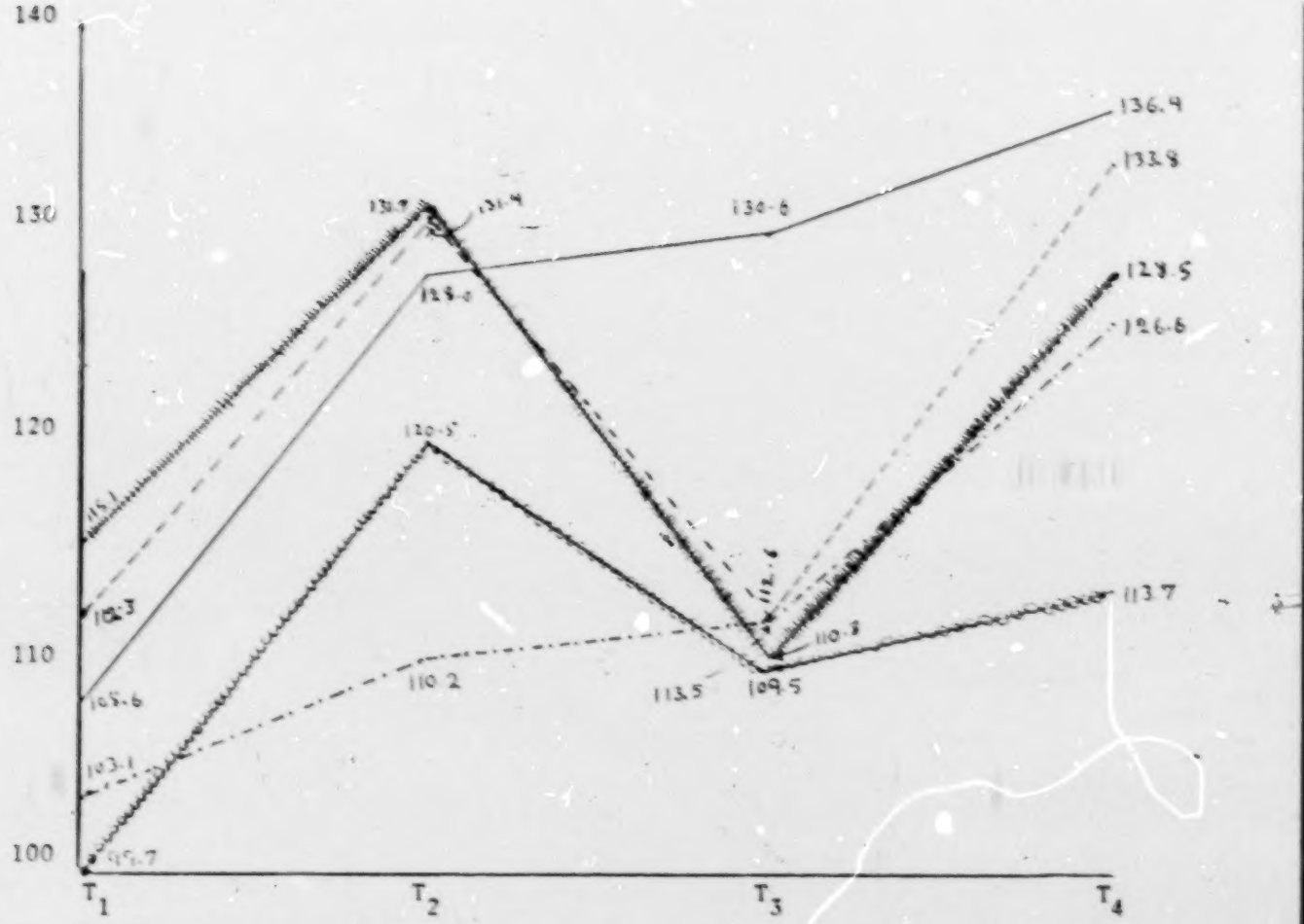
The most outstanding finding to emerge in this follow-up study of the effects on later development of enriched infant group care is the relative convergence of all advantaged groups at the same high cognitive level around 130 IQ. Far from regressing to or toward pre-infant program levels, as has tended to be characteristic in early education studies

with disadvantaged children, all advantaged groups, including the residual home reared sample, augmented mean gains made during the infant program period. There mean cognitive gains are paralled by a generally rising trend on ratings on socioemotional and motivational characteristics observed during mental testing. True, earlier entering-longer staying infants and Year II-III cohorts gained more cognitively compared to their respective counterparts, these subgroups reaching mean levels approaching 140 IQ; but again all advantaged groups made further mean gains and other subgroups (namely, girls and high infant program gainers) also approached a 140 IQ level. Moreover, none of the differences between groups in their initial to final gain scores were significant by analysis of covariance, including changes between some groups in relative cognitive status from the pre-infant program to the final follow-up period. The most notable changes in relative position were the final advantage of girls over boys and of Year II-III cohorts compared to Year I cohorts.

The basis for this continuing pattern of developmental gains, among advantaged children, both cognitively and socioemotionally, is perhaps easiest to explain through comparison with the disadvantaged sample, which was the only group that declined in IQ between graduation from the infant program and the second follow-up testing. It would appear that advantaged day care parents, more than disadvantaged day care parents followed through with developmentally appropriately stimulation during the follow-up period. At the time of the original study, it appeared that advantaged parents were able to assimilate more conceptually and thus incorporate in a permanent repertoire of child rearing skills the principles presented in the parent guidance program during infancy. But there is also evidence that the life situation of the disadvantaged families has remained more disadvantaged and the sample is small.

The relatively high gain and convergence of the home reared control leaves the question open to several alternative interpretations, which may well have worked in some combination. The residual matched pair samples are reduced from N=18 to N=11 and they are in any case quasi-experimental controls. The general longterm upward trend in all advantaged groups points to developmental population trends reflected in biased sampling and the uncertainties of measurement during early infancy, but these trends may also reflect as much or more the developmental consequences of early stimulation, which operated, not only through intended progran effects but through the guidance control parents received through many observations of repeated IQ testing. The lack of correlation between maternal IQ scores and infant IQ scores (either changes or final scores) would support the role of environmental factors. At worst, it would appear that early infant group care can be at least as beneficial as early infant home care. The persistance of high level cognitive developmental gains for advantaged children compared with frequent regression of disadvantaged children (reported here in a small sample) holds many implications for educational systems and issues of socioeconomic inequities. There are additional follow-up studies planned.

Figure 1: A Comparison of Mean Mental Scores and Changes[a] of Three Day Care and One Home Reared Group During the Infant Program ($T_1$, $T_2$) and Follow-up Periods ($T_3$, $T_4$)




| Mean Age (Mos.) | Entry | Graduation | First Follow-up | 2nd Follow-up |
|---|---|---|---|---|
| ——— | 15.8 | 26 | 57.9 | 69.4 |
| -.-.-.-.-.-. | 14.8 | 26.1 | 56.8 | 67.5 |
| ---------- | 14.8 | 26.2 | 56.8 | 67.5 |
| ——— | 8.6 | 16.4 | 35.6 | 45.2 |
| oooooooooooo | 5.3 | 16.2 | 40.3 | 51.5 |

[a]No significant difference by analyses of covariance between any of the change score combinations except for the non-comparable $T_3$ declines.

——— Matched Pairs-Day Care (N=11)

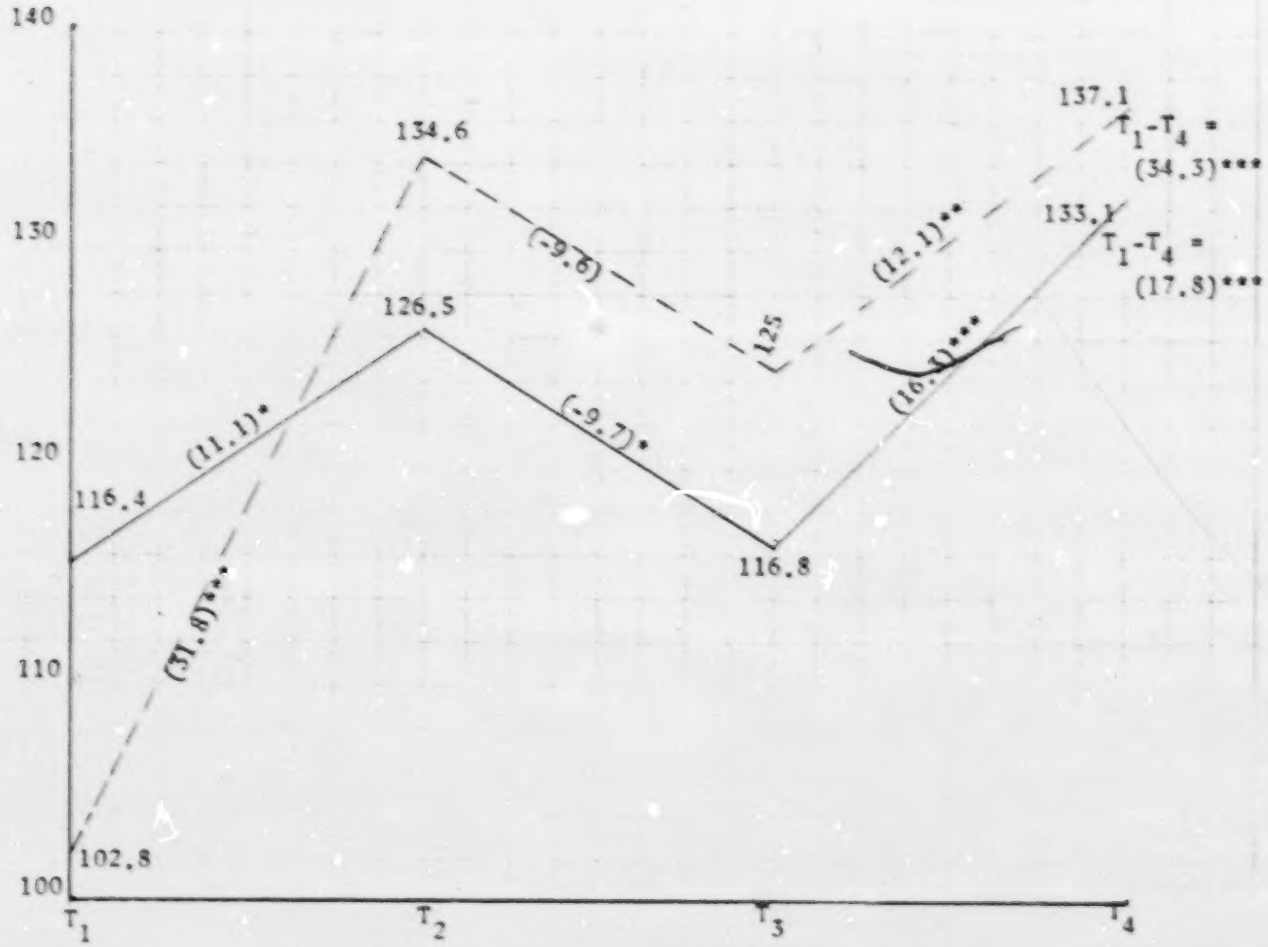
-.-.-.-.-.-.- Matched Pairs-Home Reared (N=11)

---------- Total Year I Cohorts, (N=16)

——— Year II, III Cohorts, (N=12)

oooooooooooo Inner City (N=6)

Figure 2: Mean Mental Test Scores and Changes[a] of Cumulative Samples of Advantaged Boys (N=16) and Girls (N=12) During the Infant Day Care Program ($T_1$, $T_2$) and Two Follow-up Periods ($T_3$, $T_4$)




| | $T_1$ Entry | $T_2$ Graduation | $T_3$ First Follow-up | $T_4$ 2nd Follow-up |
|---|---|---|---|---|
| Mean Age (Mos.) | | | | |
| ——— | 13.2 | 23.3 | 49.9 | 58.3 |
| - - - - - - - - - | 11 | 20 | 44.2 | 53.8 |
| Mental Tests Used | Bayley | Binet[b] | Griffith GQ[a] | Binet |
| | Infant Program | | Follow-up Studies | |

[a] significance levels evaluated by t-tests (two tailed). No significant difference by analyses of covariance between any of the change score combinations.

* $p \leq .05$

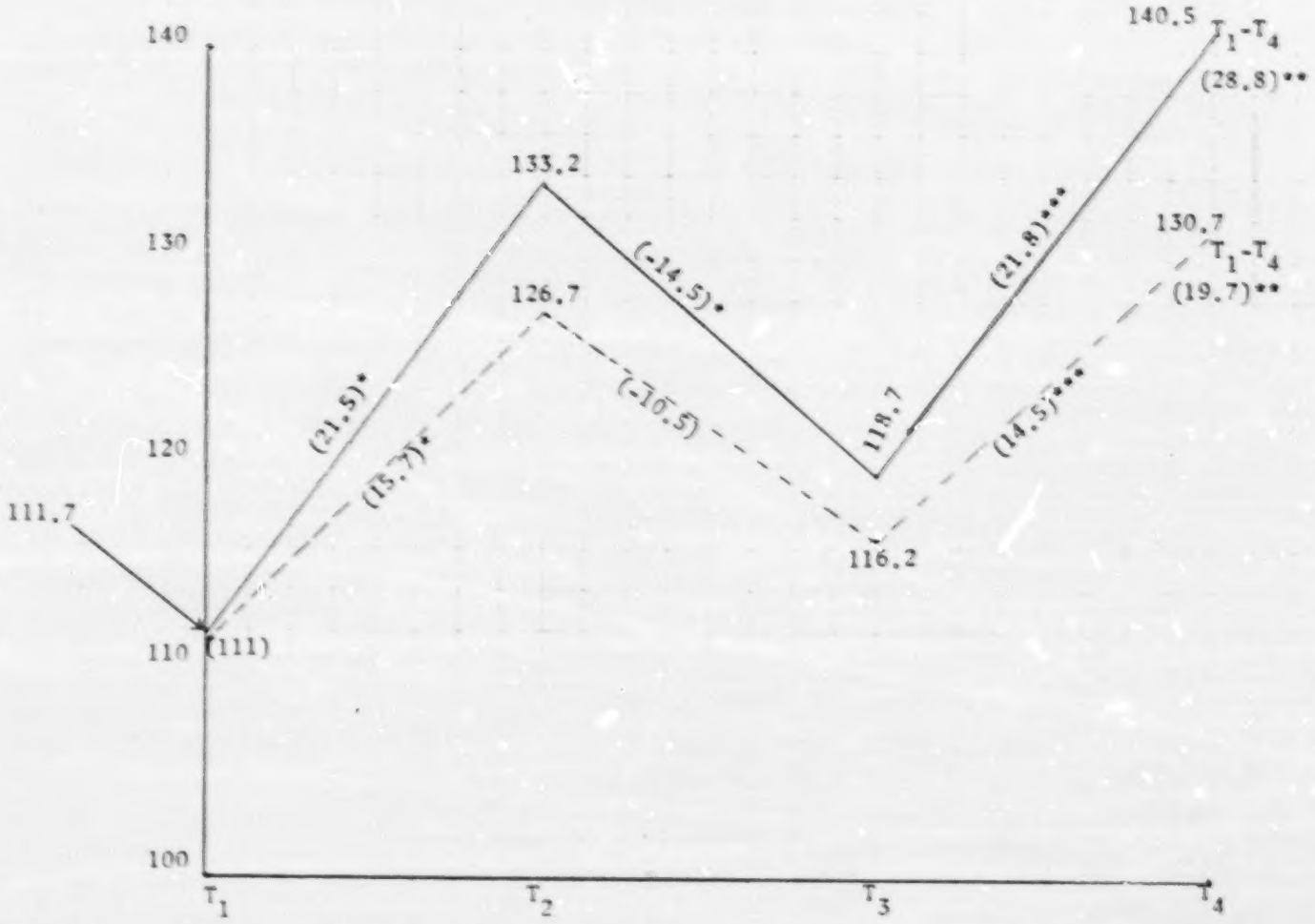
** $p \leq .05$

*** $p \leq .01$

——— Day Care Advantaged Boys

- - - - - - - - - - Day Care Advantaged Girls

Figure 3: Mean Mental Test Scores and Changes[a] of Cumulative Samples of Advantaged Mothercraft Day Care Children by Age of Entry and Length of Stay in Program During Infant Program ($T_1$,$T_2$) and Two Follow-up Periods ($T_3$,$T_4$)




| Mean Age (Mos.) | Entry | Graduation | First Follow-up | 2nd Follow-up |
|---|---|---|---|---|
| ———— | 9.2 | 24.5 | 46.8 | 57.1 |
| ---------- | 18.4 | 23.4 | 55.2 | 66.1 |
| Mental Tests Used | Bayley | Binet | Griffith GQ | Binet |
| | Infant Program | | Follow-up Studies | |

[a]significance levels evaluated by t-tests (two tailed). No significant difference by analyses of covariance between any of the change score combinations.

* $p \leq .05$

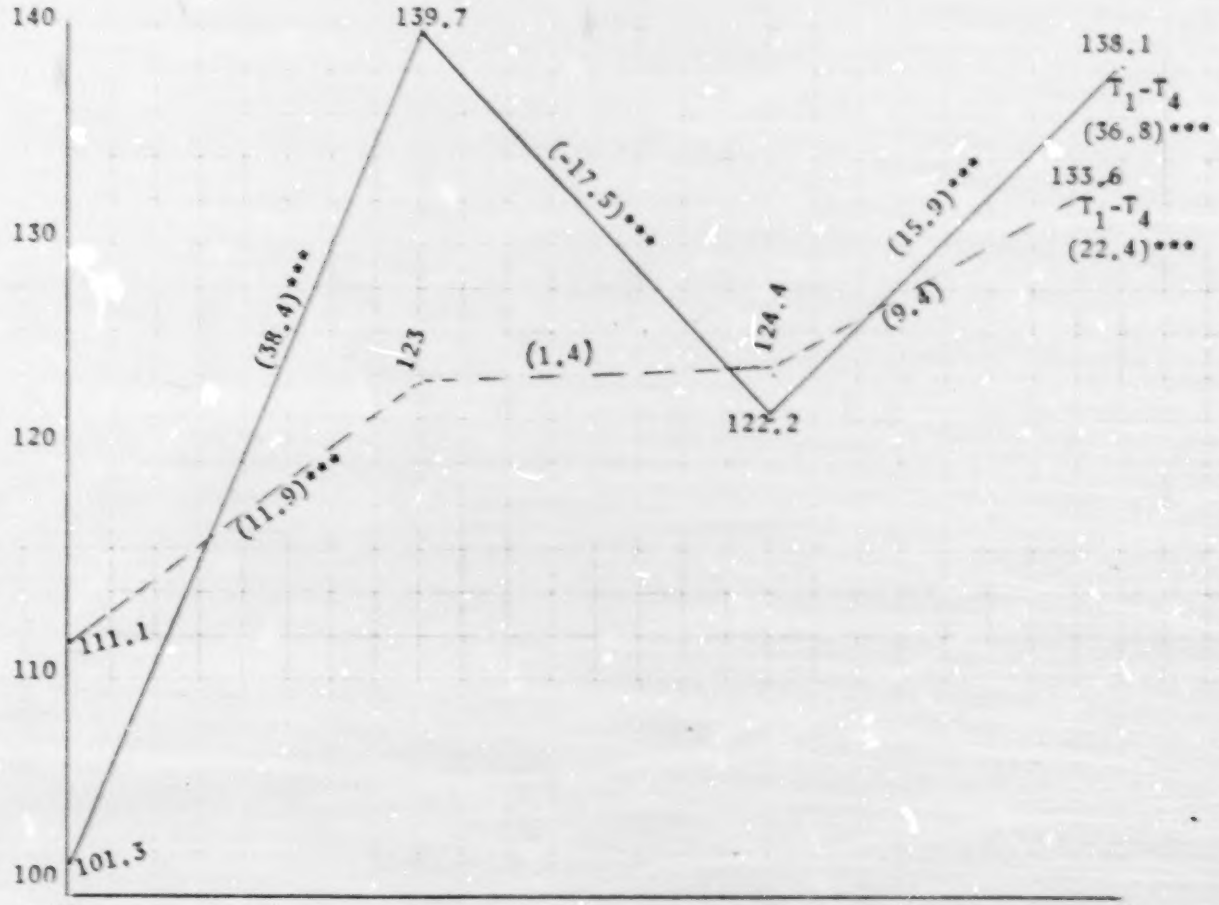
** $p \leq .05$

*** $p \leq .01$

———— Earlier Entry & Longer Stay (N=10)

---------- Later Entry & Shorter Stay (N=10)

Figure 4: A Comparison of Mean Mental Test Scores and Changes[a] of Cumulative Samples of Advantaged High and Low IQ Program Gainers During Infant Day Care Program ($T_1$, $T_2$) and Two Follow-up Periods ($T_3$, $T_4$)




| | Infant Program | | Follow-up Studies | |
|---|---|---|---|---|
| Mean Age (Mos.) | $T_1$ Entry | $T_2$ Graduation | $T_3$ First Follow-up | $T_4$ 2nd Follow-up |
| ——— | 7.8 | 20.3 | 43.8 | 54.8 |
| - - - - - - - - - - | 8.4 | 17.3 | 36.2 | 48 |
| Mental Tests Used | Bayley | Binet | Griffith GQ | Binet |

[a] significance levels evaluated by t-tests (two tailed). No significant difference by analyses of covariance between any of the change score combinations.

* $p \leq .05$

** $p \leq .05$

*** $p \leq .01$

——— High IQ gainers during infant day care ($\geq$ 20 IQ points) (N=13)

- - - - - - - - - - Low IQ gainers during infant day care ($<$ 20 IQ points) (N=9)

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